

May 31, 1932.

F. J. WINTERER ET AL

1,860,375

SAFETY LOWERING DEVICE

Filed Dec. 6, 1930

4 Sheets-Sheet 1

Fig. 1.

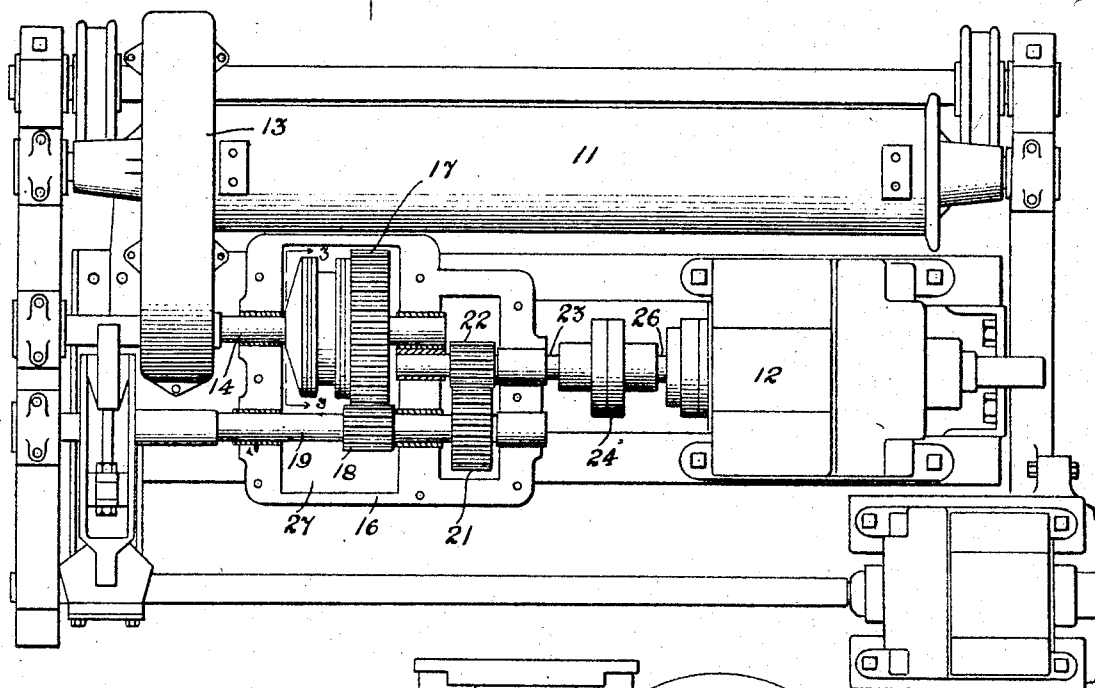
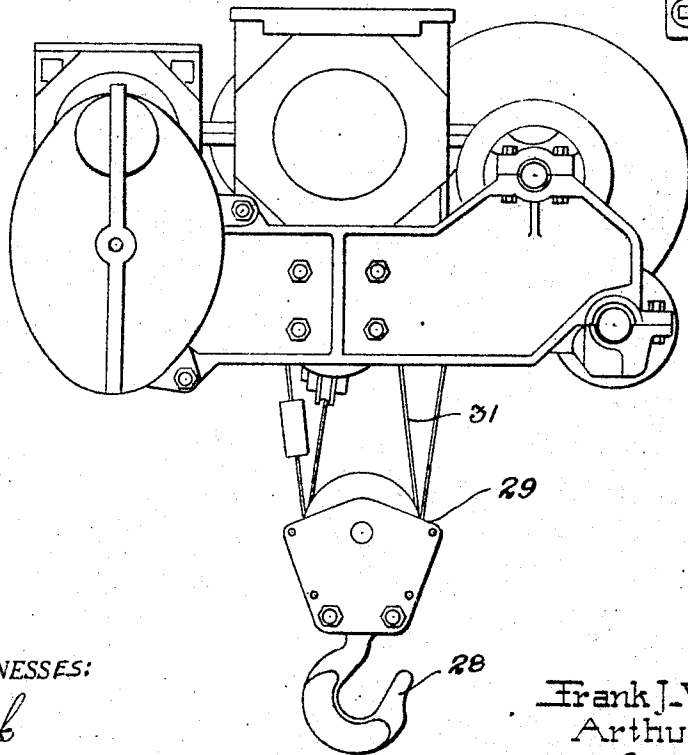


Fig. 2.



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Fig. 3.

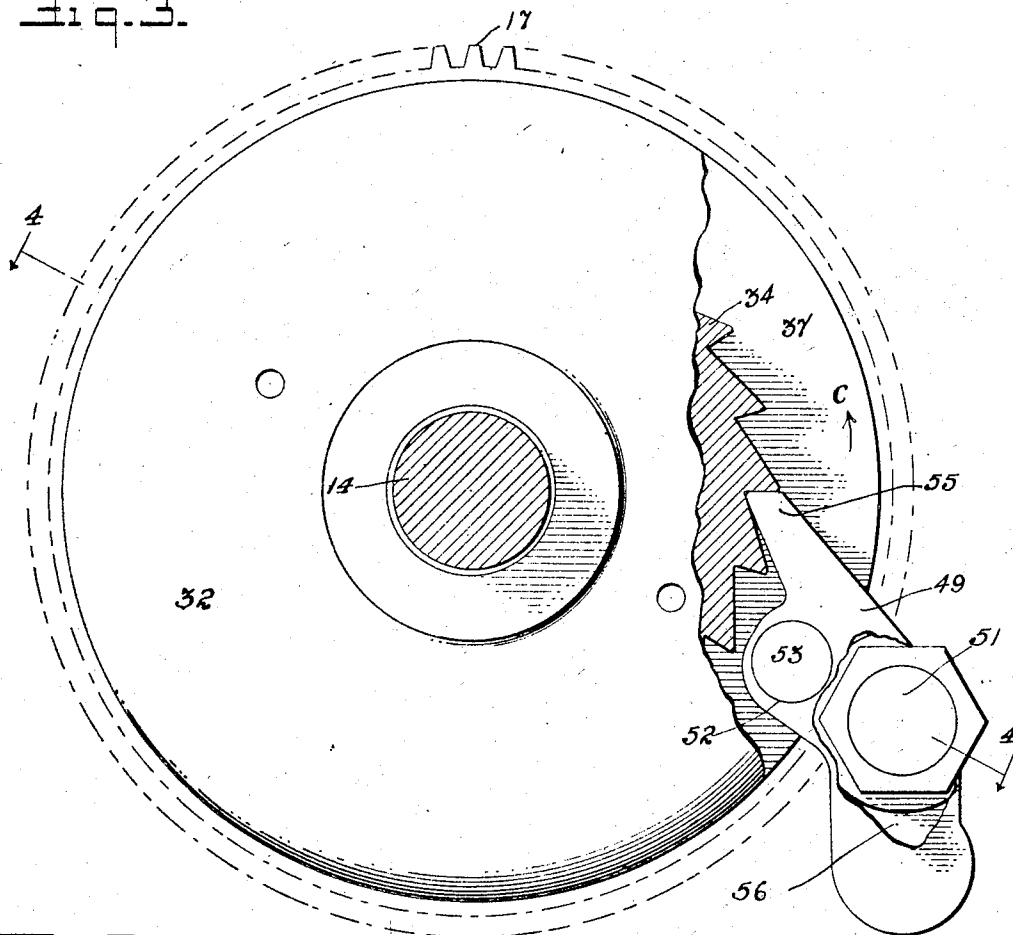
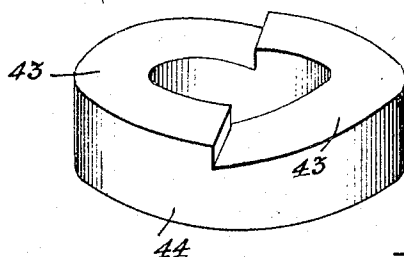


Fig. 7



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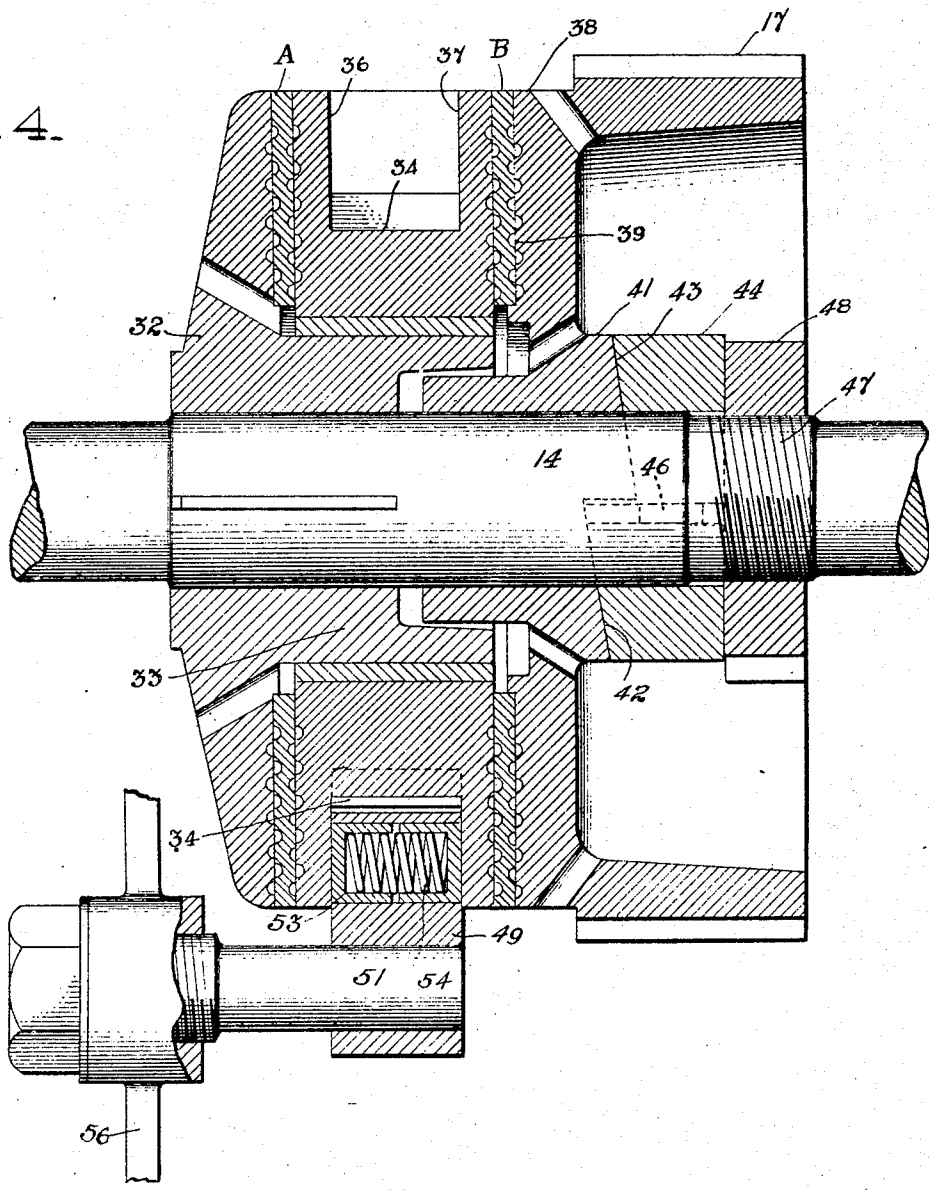
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4 Sheets-Sheet 3

Fig. 4.



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Fig. 5.

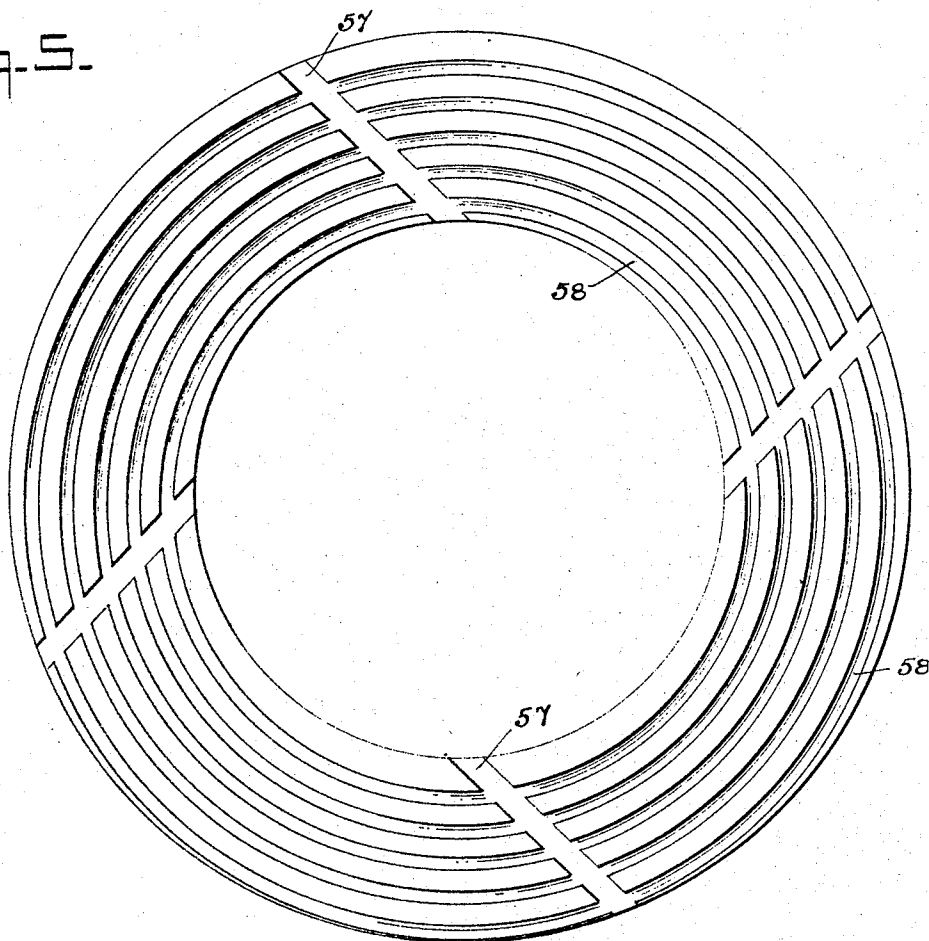
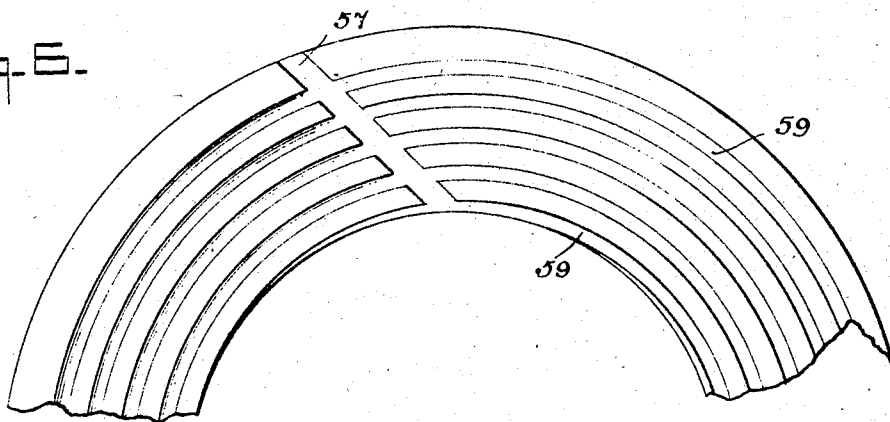


Fig. 6.



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UNITED STATES PATENT OFFICE

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SAFETY LOWERING DEVICE

Application filed December 6, 1930. Serial No. 500,564.

This invention relates to hoisting machinery, and has particular reference to a safety lowering device for supporting the load.

In hoisting machinery, where the load is carried by a hook fastened to a cable wound upon the drum, and that drum connected to power means such for instance as a motor, if the motor were to stop without the provision of a load brake, or the like, the load would immediately drop to a place of rest, rotating the drum which would in turn freely rotate the rotor of the motor.

In order that the load may be supported at any desired elevation when the hoisting motor stops, hoisting machinery is provided with devices which prevent the load from rotating the drum. These devices are known in different types of hoisting machinery as "load brake", "safety lowering device", "automatic mechanical brake" and still other names having similar meanings.

Any type of brake used widely in hoisting machinery employs a ratchet device, frictionally engaging means for supporting the load through friction plates or disks. These disks are partially submerged in oil to lubricate the same, and to give them a long life by preventing the frictional grinding of the same.

This invention relates to a safety lowering device, or load brake of the type employing friction disks partially submerged in oil, or lubricating fluid.

The object of the invention is to provide an improved safety lowering device.

A further object of the invention is to provide a safety lowering device in which the slippage, due to lubrication, will be reduced to a minimum.

A still further object of the invention is to so construct friction disks, that while all the advantages of lubrication may be procured, the usual attending objection of slippage will be eliminated.

According to the invention, the safety device comprises a shaft operatively connecting a hoist drum, a member rotatably and slidably mounted on a shaft and operatively connected to power means, an inclined face

on said member, a flange fixedly mounted on said shaft, a ratchet rotatively mounted with respect to said flange, a pressure ring slidably mounted on said shaft and having an inclined face adapted to co-act with the inclined face of said member for moving said member toward said ratchet and flange, friction disks idly mounted with respect to said shaft on each side of said ratchet and between said flange and said member, and being partially submerged in lubricating oil, and eccentric oil grooves in the faces of said disk for receiving excess oil wiped from the disk faces during the relative rotation of said disks, ratchet, flange and member.

The interaction of the inclined faces of the member, and slidably mounted pressure ring will force the said member toward the fixedly mounted flange, and thereby exert pressure between said member, said ratchet and said flange, and between each of which there is a friction disk.

The drawings illustrate an embodiment of the invention, and the views therein, are as follows:—

Figure 1 is a top plan view of a traveling crane embodying the invention,

Figure 2 is an end elevation of the same,

Figure 3 is a vertical sectional view of the safety lowering device taken on the line 3—3 of Figure 1, with a part of the flange broken away to reveal the ratchet and pawl,

Figure 4 is a cross sectional view of the safety lowering device taken on the line 4—4 of Figure 3,

Figure 5 is a face view of a friction disk,

Figure 6 is a fragmentary similar view showing another form of oil groove, and

Figure 7 is a perspective view of the pressure ring.

While the invention herein disclosed may be embodied in many different types of hoisting machinery, for the purpose of this application it has been shown and will be described in connection with an ordinary traveling crane.

Referring to Figure 1, 11 indicates a hoist drum which is operatively connected to the motor 12, through the following mechanism. Suitable gear mechanism (not shown) in the

casing 13, connects the hoist drum with the shaft 14. This shaft extends into a casing 16, and is suitably journaled therein.

Mounted on the shaft 14, is a gear 17 which meshes with a pinion 18 on a shaft 19. The last named shaft is also provided with a gear 21 which meshes with a pinion 22 on a stub shaft 23, which is connected through a suitable coupling 24 with a motor shaft 26.

The mechanism of the present invention is mounted on the shaft 14 within the compartment 27 of the casing 16. That mechanism is shown in vertical section in Figure 4.

Referring now to Figure 2 of the drawings, the crane is provided with a hook 28, having the block 29, which is carried by suitable cables 31, extending over and around the hoist drum 11.

The mechanism shown within the compartment 27, of the casing 16 in Figure 1, and in section in Figure 4, comprises the safety lowering device. This device consists generally of a flange 32, having a hub 33, on which is rotatably mounted a ratchet 34, having flanges 36 and 37. Between the flange 32, and the flange 36 of the ratchets, there is a friction disk A.

Rotatably and slidably mounted on the shaft 14, is a member 38, whose outer peripheral face provides the gear 17, illustrated in Figure 1. This member has an inner face 39, between which and the flange 37 of the ratchet 34, there is a friction disk B. These friction disks A and B are idly mounted with respect to the shaft 14.

The hub 41 of the member 38, has an inclined outer face 42, which is shown in the present instance as a helix and a like face 43 on a pressure ring 44. This pressure ring is keyed to the shaft 14 by means of the key 46, which key, however, provides for the sliding movement of the said ring on the shaft 14. The shaft 14 is provided with a threaded part 47 for receiving a nut 48 which positions the pressure ring 44 as desired.

The ratchet 34 is engaged by a pawl 49 which is pivotally mounted on a stub shaft 51. The pawl has a circular hole 52, into which there is fitted a pair of ferrules, or cups 53, with a spiral spring 54, seated in said cups, and pressing the same outward so as to form a frictional contact with the opposed faces of the ratchet flanges 36 and 37.

It will be readily understood, that when the ratchet moves in the direction shown by the arrow C in Figure 3, the frictional engagement of the cups 53 against the opposed faces of the flanges 36 and 37, will cause the pawl to move on its pivoting pin 51, and the tooth 55 thereof, will be thrown out of the ratchet 34, and such frictional engagement with the said flanges will, in like manner, throw the said tooth into holding relation with the ratchet 34 when the same operates

in a direction opposite to the direction shown by the arrow C, in Figure 3.

This pawl 49 is mounted on a suitable bracket 56, which fixedly mounts the same so that when its tooth 55 is in engagement with the ratchet 34, said ratchet will be prevented from rotating.

It is absolutely essential to the construction herein described, that the operating parts thereof should be well lubricated. To provide this necessary lubrication, oil is placed in the compartment 27, whose level is such that the lowermost part of the inner diameter of the flanges A and B will be below that level, so that the said disks will be properly lubricated.

If these disks were not lubricated, they would be quickly ground away, and it would be necessary to tear down and reassemble the safety lowering device quite frequently.

The problem which has heretofore confronted engineers, is that of properly lubricating these friction disks and at the same time, providing the required friction between them and their co-acting surfaces. Various methods and means have been suggested. Slots 57 have been provided for returning excessive oil to the bottom of the compartment 27.

It has been found by intensified experimentation, that a series of eccentric oil grooves 58 will permit the surfaces, which co-act with said disks, to wipe superfluous oil, or lubricating fluid from the faces of said disks and co-acting surfaces so as to allow the faces of the disks and co-acting surfaces to provide the proper frictional contact for efficiently holding the shaft 14 against rotation by the load of the hoist drum, while still providing the proper amount of lubrication to preventing the grinding of the disk faces and co-acting surfaces.

The present invention also contemplates the use of anti-friction material in the co-acting inclined faces or helices 42 and 43, so that upon the movement of the shaft 14 in a direction to force said faces together, the member 38 may freely move longitudinally on the shaft 14 and exert the maximum pressure against the flange 32 between which, there is confined the ratchet 34 and friction disks A and B.

The operation of the safety lowering device will be self-evident from the explanation of the construction, and the oil wiping effect on the friction disks provided by the eccentric grooves 58, will provide a lowering device with the minimum amount of slippage coupled with longevity in the friction surfaces.

Figure 6 shows a spiral oil groove 59 which is equally effective for receiving the excess oil which is wiped therein from the faces of the disks and co-operating surfaces.

Of course, the safety lowering device illus-

trated, may be modified and changed in various ways without departing from the invention herein set forth and hereinafter claimed.

The invention is hereby claimed as follows:—

1. A safety lowering device comprising a shaft operatively connecting a hoist drum, a member rotatably and slidably mounted on said shaft and operatively connected to power means, an inclined face on said member, a flange fixedly mounted on said shaft, a ratchet rotatably mounted with respect to said flange, a pawl fixedly mounted, a pressure ring adjustably mounted on said shaft and having an inclined face adapted to co-act with the inclined face of said member for moving said member toward said ratchet and flange, friction disks idly mounted with respect to said shaft on each side of said ratchet and between said flange and said member and being partially submerged in lubricating fluid, and eccentric oil grooves arranged to drain and carry off excessive oil from between the faces of said friction disks and co-acting surfaces.

2. A safety lowering device comprising a shaft operatively connecting a hoist drum, a member rotatably and slidably mounted on said shaft and operatively connected to power means, an inclined face on said member, a flange fixedly mounted on said shaft, a ratchet rotatably mounted with respect to said flange, a pawl fixedly mounted, a pressure ring adjustably mounted on said shaft and having an inclined face adapted to co-act with the inclined face of said member for moving said member toward said ratchet and flange, friction disks idly mounted with respect to said shaft on each side of said ratchet and between said flange and said member and being partially submerged in lubricating fluid, and eccentric oil grooves in the faces of said friction disks arranged to drain and carry off excessive oil from between the faces of said friction disks and co-acting surfaces.

3. A safety lowering device comprising a shaft operatively connecting a hoist drum, a member rotatably and slidably mounted on said shaft and operatively connected to power means, an inclined face on said member, a flange fixedly mounted on said shaft, a ratchet rotatably mounted with respect to said flange, a pawl fixedly mounted, a pressure ring adjustably mounted on said shaft and having an inclined face adapted to co-act with the inclined face of said member for moving said member toward said ratchet and flange, friction disks idly mounted with respect to said shaft on each side of said ratchet and between said flange and said member and being partially submerged in lubricating fluid, and eccentric oil grooves in the faces of said friction disks and co-acting

surfaces for draining and carrying off excessive oil to prevent slippage.

4. A safety lowering device comprising a shaft operatively connecting a hoist drum, a member rotatably and slidably mounted on said shaft and operatively connected to power means, a helix on said member, a flange fixedly mounted on said shaft, a ratchet rotatably mounted with respect to said flange, a pawl fixedly mounted, a pressure ring adjustably mounted on said shaft and having a helix adapted to co-act with the helix of said member for moving said member toward said ratchet and flange, friction disks idly mounted with respect to said shaft on each side of said ratchet and between said flange and said member and being partially submerged in lubricating fluid, and eccentric oil grooves arranged to drain and carry off excessive oil from between the faces of said friction disks and co-acting surfaces.

5. A safety lowering device comprising a shaft operatively connecting a hoist drum, a member rotatably and slidably mounted on said shaft and operatively connected to power means, an inclined face formed of anti-friction material on said member, a flange fixedly mounted on said shaft, a ratchet rotatably mounted with respect to said flange, a pawl fixedly mounted, a pressure ring adjustably mounted on said shaft and having an inclined face formed of anti-friction material adapted to co-act with the inclined face of said member for moving said member toward said ratchet and flange, friction disks idly mounted with respect to said shaft on each side of said ratchet and between said flange and said member and being partially submerged in lubricating fluid, and eccentric oil grooves arranged to drain and carry off excessive oil from between the faces of said friction disks and co-acting surfaces.

6. A safety lowering device comprising a shaft operatively connecting a hoist drum, a member rotatably and slidably mounted on said shaft and operatively connected to power means, a helix formed of anti-friction material on said member, a flange fixedly mounted on said shaft, a ratchet rotatably mounted with respect to said flange, a pawl fixedly mounted, a pressure ring adjustably mounted on said shaft and having a helix formed of anti-friction material adapted to co-act with the inclined face of said member for moving said member toward said ratchet and flange, friction disks idly mounted with respect to said shaft on each side of said ratchet and between said flange and said member and being partially submerged in lubricating fluid, and eccentric oil grooves arranged to drain and carry off excessive oil from between the faces of said friction disks and co-acting surfaces.

7. In a safety lowering device employing load actuated pressure means and metallic

friction disks partially submerged in lubricating fluid, eccentric oil grooves between said friction disks and co-operating surfaces for draining and carrying off excess lubricating fluid.

8. In a safety lowering device employing load actuated pressure means and metallic friction disks partially submerged in lubricating fluid, eccentric oil grooves in the faces of said disks for draining and carrying off excess lubricating fluid from between said disks and co-operating surfaces.

9. In a safety lowering device employing load actuated pressure means and metallic friction disks partially submerged in lubricating fluid, eccentric oil grooves in the faces of said friction disks and in the faces of said co-operating surfaces for draining and carrying off excess lubricating fluid from between the same.

10. In a safety lowering device employing members having helical faces for co-operative action through a load, and metal disks between parts acted upon by pressure thus produced, said helices being composed of anti-friction material and said friction disks being provided with eccentric oil grooves for draining and carrying off excessive lubricating fluid from between said disks and co-operating surfaces.

11. A friction disk for a safety lowering device comprising a plate provided with eccentric oil grooves, and oil channels connecting said grooves and open at the periphery of said disks for draining the collected lubricating fluid from said grooves.

In testimony whereof we have signed our names to this specification.

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